

WHAT IS CLAIMED IS:

1. A packet data transfer method for an IP (Internet Protocol) network or an MPLS (Multi-Protocol Label Switching) network, comprising the steps of:

5 retaining identifier (hereinafter, referred to as "flow identifier") data for identifying data to be processed and identifier (hereinafter, referred to as "control code") data for controlling the processing, in a packet data transfer apparatus having a plurality of I/O ports;

10 receiving packet data provided with said flow identifier data and control code data; and

15 in discarding packet data identified by the flow identifier data upon congestion in the packet data transfer apparatus, performing discard initiation or termination based on said control code data.

2. The packet data transfer method according to claim 1, wherein the discard initiation and discard termination of the packet data identified as packet data to be processed are conducted at packet data including predetermined control code data.

20 3. The packet data transfer method according to claim 1, wherein the discard initiation and discard termination of the packet data identified as packet data to be processed are conducted at packet data that follows packet data including predetermined control code data.

4. The packet data transfer method according to claim 1,  
wherein when said flow identifier data indicates image data, said  
control code data is generated from any of a sequence initiation  
code, a GOP (Group Of Pictures) initiation code, a picture (image  
5 frame) initiation code, and a slice initiation code included in  
the image data.

5. The packet data transfer method according to claim 1,  
wherein:

a buffer data amount at the output stage of the packet data  
transfer apparatus is monitored as to whether or not it is greater  
than or equal to a predetermined amount (hereinafter, referred  
to as "discard initiation/termination point");

if said buffer data amount increases to reach or exceed the  
discard initiation/termination point, and packet data including  
15 predetermined control code data and flow identifier data is  
received, then the discard of packet data including that flow  
identifier data is initiated; and

if said buffer data amount decreases to fall below the  
discard initiation/termination point, and packet data including  
20 predetermined control code data and flow identifier data is  
received, then the discard of packet data including that flow  
identifier data is terminated.

6. The packet data transfer method according to claim 5,  
wherein:

a plurality of discard initiation/termination points are established in association with different flow identifier data each;

said buffer data amount is monitored as to whether or not  
5 it is greater than or equal to the plurality of discard initiation/termination points established;

if said buffer data amount increases to reach or exceed any  
of the discard initiation/termination points, and packet data including predetermined control data and the flow identifier data  
10 associated with that discard initiation/termination point is received, then the discard of packet data including that flow identifier data is initiated; and

if said buffer data amount decreases to fall below any of the discard initiation/termination points, and packet data  
15 including predetermined control code data and the flow identifier data associated with that discard initiation/termination point is received, then the discard of packet data including that flow identifier data is terminated.

7. The packet data transfer method according to claim 1,  
20 wherein:

a buffer data amount at the output stage of the packet data transfer apparatus is monitored as to whether or not it is greater than or equal to a first predetermined amount (hereinafter, referred to as "discard initiation point"), and whether or not

it is greater than or equal to a second predetermined amount (hereinafter, referred to as "discard termination point") smaller than said first predetermined amount;

if said buffer data amount increases to reach/exceed the discard initiation point, and packet data including predetermined control code data and flow identifier data is received, then the discard of packet data including that flow identifier data is initiated; and

if said buffer data amount decreases to fall below the discard termination point, and packet data including predetermined control code data and flow identifier data is received, then the discard of packet data including that flow identifier data is terminated.

8. The packet data transfer method according to claim 7, wherein:

a plurality of discard initiation points and discard termination points are established in association with different flow identifier data each;

said buffer data amount is monitored as to whether or not it is greater than or equal to the plurality of discard initiation points established, and whether or not it is greater than or equal to the plurality of discard termination points established;

if said buffer data amount increases to reach or exceed any of the discard initiation points, and packet data including

predetermined control data and the flow identifier data associated with that discard initiation point is received, then the discard of packet data including that flow identifier data is initiated; and

5 if said buffer data amount decreases to fall below any of the discard termination points, and packet data including predetermined control code data and the flow identifier data associated with that discard termination point is received, then the discard of packet data including that flow identifier data is terminated.

10 9. A packet data transfer method for transferring packet data by using a router comprising a plurality of ingress cards each for establishing connection with an input line, a plurality of egress cards each having a data discard function and a buffer, 15 for establishing connection with an output line, and a switch connected to said plurality of ingress cards and said plurality of egress cards, said packet data being a plurality of pieces of packet data into which layered coded image frame data is packetized by layer, having a header including a field to be set with 20 destination address information, a field to be set with flow identifier data for identifying each layer, and a field to be set with control code data for initiating/terminating discard, wherein:

packet data input to said ingress cards is transferred to

said switch so that the packet data is transferred to egress cards corresponding to the value of its address field; and

if the amount of packet data residing in any of said buffers exceeds a predetermined threshold value, the packet data to be input to that buffer is discarded by layer, based on said control code data and depending on said flow identifier data.

10. A packet data transfer apparatus comprising a plurality of ingress cards each for establishing connection with an input line, a plurality of egress cards each having a data discarding function and a buffer, for establishing connection with an output line, and a switch connected to said plurality of ingress cards and said plurality of egress cards,

the packet data transfer apparatus transferring packet data input to said ingress cards to said switch so that the packet data is transferred to egress cards corresponding to the value of its address field, said packet data being a plurality of pieces of packet data into which layered coded image frame data is packetized by layer, having a header including a field to be set with destination address information, a field to be set with flow identifier data for identifying each layer, and a field to be set with control code data for initiating/terminating discard, the packet data transfer apparatus further comprising

means for discarding, when the amount of packet data residing in any of said buffers exceeds a predetermined threshold

value, the packet data to be input to that buffer by layer based on said control code data and depending on said flow identifier data.

11. A data distribution scheme on an IP network, for  
5 distributing transmission data with flow identifier data for identifying said transmission data and control code data for controlling the discard initiation or termination of said transmission data in the middle of transmission arranged in a DS (Differentiated Services) field in the IP packet header thereof.

12. A data distribution scheme on an MPLS network, for  
10 distributing transmission data with flow identifier data for identifying said transmission data and control code data for controlling the discard initiation or termination of said transmission data in the middle of transmission arranged in a label field in the MPLS packet header thereof.

13. A packet data generating method for generating packet data from layered data consisting of a plurality of streams, wherein:

15 flow identifier data for identifying each layered data to be transmitted and control code data for initiating or terminating a discard operation when congestion occurs during transmission are added to each piece of said layered data partitioned by predetermined size, to form layered packet data; and

UDP (User Datagram Protocol) headers are added thereto for UDP packetization.

14. A data shaping method comprising the steps of:

receiving a data row which is distributed after created in such a manner that flow identifier data for identifying each layered data in layered data consisting of a plurality of streams, a sequence number to be consecutively given to data partitioned by predetermined size, and control code data for initiating or terminating a discard operation of each layered data are added to each layered data partitioned by said predetermined size to create layered packet data, followed by UDP packetization and IP packetization;

reconstructing UDP packet data and said layered packet data from the IP packet data row received, and discarding data from which UDP data is not reconstructible;

checking for continuity in the sequence numbers of said reconstructed layered packet data by each flow identifier data; and

when the sequence numbers are discontinuous, and if said control code data is control code data for initiating the discard operation, discarding subsequently-received layered packet data up to the one immediately preceding the layered packet data including the next control code data, and if said control code data is control code data for terminating the discard operation, discarding subsequently-received layered packet data up to the one including the next control code data, applying UDP



packetization and IP packetization to following layered packet data, and distributing the resultant to the same destination as that at reception.

15. A data shaping apparatus comprising:

5 means for receiving data created in such a manner that flow identifier data for identifying each layered data in layered data consisting of a plurality of streams, a sequence number to be consecutively given to data partitioned by predetermined size, and control code data for initiating or terminating a discard operation of each layered data are added to each layered data partitioned by said predetermined size to create layered packet data, followed by UDP packetization and IP packetization;

means for reconstructing UDP packet data and layered packet data from the IP packet data received;

15 means for discarding data if UDP data is not reconstructible from the data;

means for checking for continuity in the sequence numbers of said reconstructed layered packet data by each flow identifier data;

20 means for discarding, if said control code data is control code data for initiating the discard operation, subsequently-received layered packet data up to the one immediately preceding the layered packet data including the next control code data, as well as discarding, if said control code data is control code data

for terminating the discard operation, subsequently-received layered packet data up to the one including the next control code data, applying UDP packetization and IP packetization to following layered packet data, and distributing the resultant to the same destination as that at the time of reception, in the cases where the sequence numbers are discontinuous; and

means for applying, in the cases where the sequence numbers are continuous, UDP packetization and IP packetization to all layered packet data received and distributing the resultant to the same destination as that at reception.

16. A decoding scheme comprising the steps of:

receiving an IP packet data row which is distributed after created in such a manner that flow identifier data for identifying each layered program data in layered audiovisual program data consisting of a plurality of audiovisual streams, a sequence number to be consecutively given to data partitioned by predetermined size, and control code data for initiating or terminating a discard operation of each layered data are added to each layered data partitioned by said predetermined size to create layered packet data, followed by UDP packetization and IP packetization;

reconstructing UDP packet data and said layered packet data from the IP packet data row received;

discarding data if UDP data is not reconstructible from the

data;

checking for continuity in the sequence numbers of said reconstructed layered packet data by each flow identifier data; and

5 when the sequence numbers are discontinuous, and if said control code data is control code data for initiating the discard operation, discarding subsequently-received layered packet data up to the one immediately preceding the layered packet data including the next control code data, and if said control code data is control code data for terminating the discard operation, discarding subsequently-received layered packet data up to the one including the next control code data and decoding following layered packet data.

17. A data decoding and displaying apparatus comprising:

15 means for receiving IP packet data which is distributed after created in such a manner that flow identifier data for identifying each layered program data in layered audiovisual program data consisting of a plurality of audiovisual streams, a sequence number to be consecutively given to data partitioned  
20 by predetermined size, and control code data for initiating or terminating a discard operation of each layered data are added to each layered data partitioned by said predetermined size to create layered packet data, followed by UDP packetization and IP packetization;

means for reconstructing UDP packet data and layered packet data from the IP packet data received;

means for discarding data if UDP data is not reconstructible from the data;

5 means for checking for continuity in the sequence numbers of said reconstructed layered packet data by each flow identifier data;

means for discarding, if said control code data is control code data for initiating the discard operation, subsequently-received layered packet data up to the one immediately preceding the layered packet data including the next control code data, and if said control code data is control code data for terminating the discard operation, discarding subsequently-received layered packet data up to the one including the next control code data and decoding following layered packet data, in the cases where the sequence numbers are discontinuous;

means for decoding, in the cases where the sequence numbers are continuous, all the layered packet data received; and

means for displaying the decoded data.

18. A packet data duplicating and distributing method comprising the steps of:

retaining flow identifier data for identifying data to be duplicated and control code data for controlling the duplication processing; and

when packet data provided with said flow identifier data and control code data is received, and the packet data identified is to be duplicated, performing duplication initiation and duplication termination on the packet data having said retained flow identifier data based on said control code data.

19. A packet data duplicating and distributing apparatus comprising:

means for retaining flow identifier data for identifying data to be duplicated and control code data for controlling the duplication processing;

means for receiving packet data provided with said flow identifier data and control code data; and

means for performing, when the packet data is to be duplicated, duplication initiation and duplication termination on the packet data having said retained flow identifier data based on said control code data.